SAFE EXPLOSIVE DEMOLITIONS OF STRUCTURES

by
GERALD MEYERS, P.E.
ALLAN HERRBACH, Explosive Safety Engineer

PURPOSE

When properly performed, the demolition of structures through the engineered and controlled use of explosives can be very time and cost effective. By reducing the need for demolition work at potentially dangerous heights and reducing the amount of mechanical demolition, worker safety often is greatly enhanced on the job site. Additional safety also is obtained because a significant part of the demolition is performed remotely. However, the execution of some explosive demolitions both within the Department of Energy (DOE) and within general industry has raised significant questions as to whether the potential increase in the level of safety always has been achieved.

The purpose of this handbook is to provide essential background to DOE site managers on how to manage explosive demolition to the level of explosive safety required by DOE safety policies. The basic philosophy of this handbook is to learn from all experiences with explosive demolition within the DOE and general industry and establish guidelines for the management of safe and effective demolition. Practical solutions to the mandatory DOE safety requirements are made as well as recommendations for smart and effective practices. It is believed by the authors who have worked extensively throughout their careers with explosives and explosive effects on facilities that when safe practices are formulated into the work-plan early on, very little if any extra cost is actually entailed. Very often the extra discipline and planning required and extra expertise brought to bear will resolve other potential problems before they arise.

Considerable expertise has been transferred to this effort from the explosive safety community within DOE and the Department of Defense (DOD) to support this effort. Valuable help also was provided from governmental authorities such as the New York City Fire Department (NYFD) and the Health and Safety Executive of the United Kingdom (the British equivalent of OSHA) that have considerable experience in regulating this activity. In addition, productive discussions were held with many of the leading firms that perform explosive demolition to ascertain the workability of both the governing regulations and recommendations.

Explosive demolition contractors, who are most likely hired on past proven ability to safely demolish the class of structure, can be relied upon for expertise as to where to configure, size, and place explosive charges. They are also very experienced in the design of explosive initiation systems and the use of time delay devices. As long as they operate within the confines of the mandatory DOE explosive safety criteria, and common safety sense, they should be given full latitude in this regard. However, very few if any are experts on the full range of explosives and their effects. It is important for the DOE user to realize that, unlike industry, the DOE itself, in a corporate sense, is a world class expert and practitioner with explosives. A mishap in this area is not only tragic in itself, but also would reflect badly upon the explosives areas where

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the Department has highly visible and critical responsibility. The DOE has within its ranks tremendous expertise with essential sub-disciplines such as explosives storage criteria, detonation and firing sets, air blast propagation, fragment prediction and shielding, shape charge effects, practical blasting experience, explosive ordnance disposal, explosives handling, structural analysis of facilities under dynamic loading, and explosives classification. It would not be wrong to say that the collective DOE knowledge and experience in this field may well exceed that of any of the practicing contractors. In the DOE's milieu of proven expertise and mandated safety standards, that are above the level of standard industry, it is unwise to leave all safety issues to the assumed expertise of the demolition contractor. This expertise is readily available to site management through the complex for any site that might need support. If needed, Mr. Gerald Meyers at the Office of Field Support, EH-53, (301) 903-3190 will arrange for high quality technical support throughout the complex.

GENERAL BACKGROUND

Few rules of thumb exist for the actual height and class of structure that is ideally suited for demolition by explosive means. Typically, structures that are good candidates are at least five stories tall, where their heights make mechanical demolition both expensive and hazardous. Tall smokestacks and water towers are also good candidates. Good construction management practice will price the job both ways, as many of the specific properties of DOE and DoD structures may make the typical rules of thumb for determining the method of demolition misleading. Specialty structural elements such as massive reinforced concrete pedestals or massive concrete foundations are also good candidates for explosive demolition where a well tamped and confined dynamite charge is used to break up the "monolith" for mechanical removal.

Typically, three classes of structures have been identified as most suitable for explosive demolition. They are steel-framed structures, reinforced concrete structures, and large reinforced concrete pedestals or foundations. The basic philosophy for the first two is to use the minimum amount of explosives to remove enough of the structural supports so that the weight of the structure will collapse the structure upon itself. Very often, explosive delays are built into the blasting circuit to sequence the cutting of structural members so that large dynamic overturning moments or torquing forces will topple portions of the structure in a fairly precise footprint. In many ways, this is analogous to the cutting down of trees.

The minimum amount of explosives is typically used. This is not only for cost purposes, but also to limit blast over-pressure, noise, debris, and fragment throw. Potential magazine storage problems also are mitigated. As different types of explosives are used in demolition, it is customary to compare their effectiveness to that of TNT. For instance 60% dynamite often is considered 78% as energetic of TNT. The RDX, PETN, C-4 or HMX used in shape charges are often 1.2 times as effective as TNT. These explosive equivalent factors are used to convert their explosive weights to TNT equivalency. By knowing this value, far field effects such as blast overpressure, fragment throw, and noise can be calculated accurately. The TNT equivalency also is needed to properly site explosive areas and establish a safety exclusion zone for personnel. As the calculation of blast effects is actually based upon the cube root of the equivalent explosive weight, equivalency factors often can be discounted for informal calculations in the field.

The actual cutting power of the explosive to the structural member, with which it is in contact, will vary greatly to this and other key factors such as speed of detonation (brissance), standoff distance, and initiation point. Generally, the demolition contractor's true expertise will be in this area and can be relied on as to the adequacy of the explosive cut. Test shots to prove the efficacy of a particular explosive configuration to a structural member should be viewed as a quality practice by the contractor. This can be used to gain assurance of complete cutting and provide a test for shielding, and may lead to a better economy in the use of the explosive. It also may permit the site to judge the adequacy of the contractor's blasting practice and blast warning system and to perform a check as to how site personnel are controlled during blasting.

Steel structures are often cut with linear shape charges. Frequently, the charges are copper clad with two charges mounted facing each other on a steel member. As shape charges highly focus their energy into a fine plasma jet, very little explosive actually is needed to cut steel. Very seldom will the charges exceed 3,200 grains per foot of explosives. As 7,000 grains equal one pound and the military style explosives such as RDX, PETN, or C-4 typically used in shape charges are no more effective than 1.2 times their explosive weight in TNT equivalence, a large steel member can be cut with as little a pound and a half of equivalent TNT. Site management should be aware that the stand-off distance between the charge and its target is critical for maximum cutting effect. Also, it is typical for a booster charge to be placed between the detonator or detonation cord and the shape charge to assure detonation of the shape charge. A fastidious blaster may prime the shape charge on both ends to increase the assurance of detonation. This method, known as double-priming, is highly recommended and reduces the risk of a misfire. The shape charge and initiation point should also extend slightly (a few inches) beyond the member so that a uniform jet has space to develop. Also, since it is very possible for the back metal liner of the shape charge and spalled metal from the structural member to become high velocity fragments, adequate shielding will be required.

A "kicker" charge of bulk explosive will often be placed mid-span on the structural member to kick the structural member out milliseconds after the shape charge has cut the top and bottom of the member. Time-delay devices are often used here. To provide maximum thrust, this charge is usually tamped with sandbags to increase the confinement of explosive gas pressures. Some benefit may be obtained by placing a thin material, such as neoprene, between the charge and the member to provide for less metal spalling and force the applied explosive load to be a little more uniform. Adequate shielding also will be required around these charges as high speed metal fragments may result. The DOD reports the finding of these metal fragments at distances in excess of 1000 feet.

Reinforced concrete, masonry, and pedestal structures afford the opportunity to drill into their interiors and tamp and contain the explosive charge. Explosives with a high speed of detonation are desired if steel reinforcement is contained within the structure. Dynamite containing nitroglycerine is typically used. A detonation speed of 18,500 feet per second is a good minimum value. The effectiveness of the shots in all concrete or masonry is greatly enhanced by stemming and confining the gaseous products of combustion to perform the maximum amount of mechanical work. Typical explosive charge densities are 2.5 pounds per

cubic yard on lower floors, with holes slightly less charged on higher floors (1.75 to 2 pounds per cubic foot) Unreinforced concrete typically is charged with 40% to 50% of these values.

GOVERNING REGULATIONS

Several controlling criteria govern explosives operations and mandate specific levels of explosives safety within the DOE. DoD sites will be governed by very similar levels of safety and common provisions. While conformance with these criteria and ways of doing explosives business are second nature to many sites, they are new to some sites that typically are not engaged in explosives operations.

DOE Order 440.1 governs all explosive operations as of September 30, 1995. This Order (which supersedes DOE Order 5480.4) states on page 4 that explosives operations are governed by the DOE Explosives Safety Manual DOE M 440.1-1.

While the Manual excludes routine construction and routine tunnel blasting from many of its provisions, it specifically does not exclude explosives demolition. This is due to the higher potential for greater fragment throw, higher history of misfire, and higher than normal risks associated with misfires. It is also important to note that all explosive operations are subject to the DOE requirements governing storage, siting, and transportation.

The DuPont Blasters Manual is particularly out of date and is no longer a governing document within the DOE. However, it is being rewritten under the auspices of the International Society of Explosives Engineers and hopefully will be issued in 1997. This manual will be considerably updated and will no longer be brand or product line specific. Upon review of this manual, it well may be designated some governing role in explosive demolition with the exception of magazine storage, magazine siting, fragment protection, and transportation requirements of explosives.

The OSHA criteria in CFR 1926 should be followed where it is stricter than the DOE Explosives Safety Manual.

MAGAZINE SITING

The DOE Explosives Safety Manual does not use the OSHA criteria for magazine siting or safety distances, but instead cites the DOD 6055.9-STD, DOD AMMUNITION AND SAFETY STANDARD. This governing criterion provides safety distances based upon engineering fundamentals and a very large review of actual explosions for both overpressure and fragments from an accidental explosion.

To protect personnel and to preclude sympathetic detonations,the following criteria are mandatory for all explosives operations on DOE property. All magazines must be sited no less than:

40 x$W^{1/3}$ feet from the nearest inhabited structure

24 x$W^{1/3}$ feet from the nearest public travel route
11 x$W^{1/3}$ feet from the nearest unbarricaded magazine
9 x$W^{1/3}$ feet from the nearest barricaded magazine

where W is the net weight of explosives in TNT equivalence in pounds. For instance if a magazine contained 1000 pounds of explosive weight in TNT equivalence, the distance to the nearest inhabited structure would be calculated as:

Safety distance = 40 x $1000^{1/3}$ = 40 x 10 = 400 feet.

This means that in the event of an accidental detonation in the magazine, the nearest inhabited structure would not be subject to more than 1.2 psi incident airblast overpressure. It is important to note that if the blast wave strikes a perpendicular surface such as a building front, the peak airblast overpressure will be shocked up to 2.4 psi. This is the actual blast load a person in front of the building or structural elements such as the buildings glazing will experience. This blast more than exceeds a tornado load and will fail conventional glazing and cause injuries.

The American Table of Distance in tables published after 1991 specifies distances equivalent to the those required for inhabited structures. However, the distances specified by this table for a barricaded magazine permits a much higher blast loading on public highways travelled by less than 3000 vehicles per day and is unacceptable for use in the DOE. Nevertheless, the tables reported for unbarricaded magazines are conservative and may be used for siting for overpressure. These commercial sector tables are based upon restricting the damage only from airblast and neglect fragment loading.

Unlike the civilian sector, the DOE and DoD require that magazines must also be sited for fragment safety from accidental detonations. These co-governing requirements mandate a 1250 foot separation to an inhabited building if 100 pounds or greater weight of TNT explosive equivalence is in the magazine, and 670 feet for less than 100 pounds. This requirement also applies to public travel routes (which legally include navigable waters and rail lines) if more than 5000 cars pass per routine day. If less than 200 cars per days pass, no fragment requirement is necessary. Between 5000 and 200 cars per day, a 750 foot fragment safety zone is required if the magazine contains more than 100 pounds, while a 400 foot safety zone is required for less than 100 pounds of net TNT equivalence.

Extra efficiency in siting can be obtained by dividing explosives so no magazine contains more than 100 pounds of TNT equivalent weight. This is permissible as long as legal separation distance between magazines is maintained to prevent sympathetic detonation if accidental detonation occurs in a magazine.

It is recommended that all magazines be barricaded by dirt berms to knock down low angle fragments. As most demolition sites have considerable dirt-moving equipment around, this is an easy task if planned early. Vegetative control is also essential around magazines as grass fires have historically caused

detonations in military magazines. An area 100 feet around the magazine shall be kept clear of vegetation and other combustibles.

The magazine shall be kept locked with the blaster having authority, control, and accountability over all explosives. During off hours, the security component of the facility should be employed to maintain positive control over the locked magazine and all explosives.

FRAGMENT PROTECTION

The DOE 6055.9 Standard also mandates a safety range from fragmentation from <u>intentional</u> detonations in Chapter 5 Section E.4.a (pages 5-11 and 5-12). The mandatory safety distance for personnel not directly involved with the detonation is:

Distance = $328W^{1/3}$, but not less than 1250 ft.

However, if the maximum throw range of the fragments or debris is known, it may be used with a safety factor to replace the 1250-ft minimum range. Demonstrated shielding around shape charges or blast mats over concrete may be used. Very often, the demolition contractor will perform some test shots on typical structural members to assure success in the cutting or break-up power of an explosive charge. This test, which should be viewed not as a sign of an inexperienced contractor, but as indicative of a very thorough one, also can be used to proof-test shielding by placing witness plate material around shielding placed around the cutting charge. Styrofoam is typically used and should cover completely all angles of fragment launch from the explosive and structural member.

This figure has been established by the Department of Defense Explosive Safety Board (DDESB), and has been based upon an exhaustive study of many explosions. If asked, the Office of Field Support, EH-53, will provide expertise for fragment control and shielding during demolition.

Personnel directly involved with the explosive demolition may be closer to the blast. While no provision has been set for the required distance for these involved personnel, a review of industrial accidents indicates that it is not rare for blasters to be injured or killed by the debris from their own explosion. Great care should be chosen in selecting a location for the blaster. Local site topography, earth berms, and intervening buildings may be used to advantage. The possibility of high angle fragments should not be neglected.

STRUCTURAL SAFETY

Very often, considerable mechanical weakening of the structure will take place prior to the explosive demolition. Great care must be exercised lest a progressive collapse be initiated with workers still in the structure. The worst case scenario is that of a structural collapse on workers with explosives in the debris-pile aggravating the rescue. OSHA requires a competent engineering analysis of the structure prior to

permitting operations in the structure (29 CFR Part 1926 Subpart T 1926.850 (a). It is not only recommended that a licensed civil engineer, with proven competence in structural engineering, be used to evaluate the safety of the mechanically weakened structure; but is required by many state engineering laws and license boards. As explosive demolition typically uses a relatively small charge weight, some consideration should be given to using more cutting charges during the actual demolition, whereby more initial weakening is done remotely.

The placement of charges on the structure is an area where the expertise resides with the contractor. As long as adherence to the mandatory requirements of blasting safety is maintained, such as fragment control, and the choice of explosive is reasonable and customary for the type of demolition, the structural engineer should not second-guess the contractor on charge composition and placement. As a practical matter, many potential disputes as to the adequacy of the shot will most likely be resolved during any test shots.

DOE has had several buildings buildings that have hung up after the first attempt at demolition. This presents two of the most serious safety issues in the field. First, a misfire situation may exist with primed explosive still in the building. Second, a building which has initially been weakened mechanically is now weakened further by blast to the point of incipient failure. A high risk situation now exists for any personnel who may have to enter or be near the structure.

The specter of such a development should be a clarion call to prevent this situation from developing by having the blaster carefully plan the shot, doubly-checking all connections, and using redundancies in detonation cord, shock tube, and initiation of main charges. If electrical blasting is used, the blaster should be able to use the blasting galvanometer to verify the continuity and connectivity of all branches of the electric circuit. The galvanometer must be used to not just check continuity of the blasting circuit at the blasting point, but careful resistance measurements must match the resolved and equivalent system of a series-parallel circuit.

If a misfire does occur, a contingency plan should be in place. The plan may include reblasting if the misfire occurs early on in the explosive train. In fact, some consideration should be given in the design of the detonation circuit (either electrical or non-electrical) to permit analysis by far field visual connections. For instance, an electrical detonator's connection to detonation cord should be done in a area where it can be inspected without entering the structure. A section of the detonator may not be taped over to allow an assessment if it has fired. Also, key branch lines might be constructed in a location where they might be accessible with less risk in the event of a partially hung building where a misfire in the branch line is accessible. Where possible, branch points should be placed outside of the structure.

A plan for rapid analysis of the building should be in place in case a building is hung and reentry is needed for replacement of charges or connections of pull cables for mechanical demolition. As most structural engineers are trained in and practice a building code approach to structural design and analysis which are inherently conservative, very few structural engineers have the expertise or confidence to make judgments about severely distressed buildings. Two highly competent structural engineering firms have been

identified as a result of their history of forensic analysis and sophisticated structural analysis. They and their point of contacts are listed as a convenience to the reader. They are:

Failure Analysis Associates
149 Commonwealth Drive.
Menlo Park, California 94025
John Osteraas, Ph.D, P.E.
(415) 688-7206

Wiss Janney Elstner Associates
330 Pfingsten Road
Northbrook, Illinois 60062
Jerry Stockbridge or Gary Klein
(847) 272-7400

It is the intent of the writers of this manual to continue to develop this list of able experts, with phone numbers, who can be consulted in this area if the need arises. It is recommended that the site arrange for one of these consultants to be on call during the blasting of a complex structure. It would be very smart to send them before the demolition a complete set of blueprints (as close to as built as possible) and a blasting plan since experience indicates that they are hard to find once an emergency sets in. These consultants can often provide field assessments of the structure very rapidly and suggest practical safety criteria for personnel near or in the damaged structure. However, the site should recall that they are not explosive experts and the site should use both the contractors and DOE's explosives expertise in support. Finally, if a structure does prove too risky to reenter, proven technology exists to bring down the structure with standoff devices such as platter charges. One by one, columns can be cut by high velocity metal impact. DOE Headquarters can arrange for military specialists to expeditiously perform this mission.

AVIATION WARNING REQUIREMENTS

The DOE Explosives Safety Manual(Chapter II, Section 13.3.1) requires the site to ensure that no aircraft can be risked being hit by any fragments from an explosive shot. One of the authors has actually spoken to a blaster who brought an aircraft out of the sky by hitting it with a fragment. Title 14 Code of Federal Regulation Part 91.137 (a)(1) requires the Federal Aviation Administration (FAA) Administrator to establish a temporary flight restriction (TFR) for aircraft in order to "Protect persons and property on the surface or in the air from a hazard associated with an incident on the surface." The TFR prohibits aircraft from legally entering airspace that the Administrator has designated as being prohibited. The TFR identifies the location, size, and affected altitudes covered by the prohibited airspace and as well as the time period during which the TFR is in effect.

The FAA has interpreted explosive demolition as a hazard to aircraft. Therefore, when an organization is planning to conduct explosive demolitions they must notify the FAA in advance in order to

allow the FAA time to establish a TFR. If you are planning to conduct an explosive demolition, then the following procedure should be followed:

1) Approximately four weeks prior to the demolition, contact the FAA Flight Standards District Office (FSDO) closest to the demolition site;

2) Provide the following information to the FSDO:
   - Proposed date and time of the demolition,
   - latitude and longitude of the demolition site,
   - total diameter of the area that may be affected around the demolition site,
   - maximum altitude above ground level that may be affected by debris from the demolition, and
   - name, title, and telephone number of the person responsible for site safety at the demolition site;

3) Assign a site safety officer with the responsibility for coordination with the FAA;

4) Designate aircraft spotters (at least 2) with the responsibility of looking for aircraft when the demolition will be conducted;

5) Establish clear communications procedures for alerting the site safety officer if aircraft are spotted in the demolition area and for delaying the demolition.

If you have any questions or require any assistance in your efforts with the FAA, contact Len Dzamba at (301) 903-7084.

This is actually a very easy requirement to meet fully, if it is planned early in the work cycle, and may be a help in keeping the media at a safe distance.

UTILITY COORDINATION

Along with the FAA, coordinate with any utility such as electric or gas that could be affected either by fragments or ground shock. The same person coordinating with the FAA can easily coordinate this function as well.

DETONATION CONTROL

Command or instantaneous detonation shall be used. This precludes the use of time fuse. Either an electric or non-electric shock tube system may be used. If a non-electric shock tube system is used, components such as detonators and connectors should be approved by the manufacturer of the shock tube up to the point of main charge or detonation cord initiation. All blasting trains and shielding shall be checked by two individuals designated by the blaster prior to the shot. At least one site and blaster already has been embarrassed by a misfire resulting from a failure to connect a detonator to a detonation cord.

All initiators or blasting machines shall be under the positive control of the person in charge of blasting. It shall not be hooked up until the last possible moment, and only after an appointed range safety officer has given assurances that both the structure and designated explosive range are cleared.

Loading explosives and the assembly of the initiation system is a hazardous operation that must be done 100% correctly to prevent misfires and assure successful collapse of the structure. Tremendous pressure often is exerted either by a site to guarantee a shot time for VIPs or media or by the schedules of contractors themselves to meet a too-busy work schedule. Site management can enhance safety by maintaining a reasonable and unrushed schedule for the shot. It is recommended that the blaster be considered the "captain of the ship" in determining the time for blasting. In fact, it may be a particularly just practice that the person who rushes the blaster should be designated the first person in to clear the misfire.

The blaster shall be assigned responsibility to assure the site superintendent that all charges have completely fired. Viewing video tape and inspection of the actual rubble should be done before other personnel are permitted within the safety perimeter. A safety briefing should be given to debris removal crews if there is even a remote chance that undetonated or partially undetonated explosives might be present or buried in debris.

Any damaged explosive found on the site shall be considered very unstable. Unless the contractor is experienced in disposal, it should be referred to the nearest military Explosives Ordnance Disposal (EOD) Team for disposal. It should be assumed that heat, impact, and shock has altered its sensitivity to detonation. Maximum support should be given to those performing disposal, even permitting detonation in or near place. Under no circumstances shall it be placed back in the magazine or transported.

PROTECTION FROM RF INTERFERENCE

All electrical blast circuits shall be protected from radio frequency (RF) interference in accordance with Chapter II, Section 13.3.5 of the DOE Explosive Safety manual. No cellular phone shall be used in a structure being prepared for demolition if electric detonators are present. While the ability to initiate low energy (standard detonators) is heatedly debated among experts, the distraction these phones bring to a critical part of assembling the explosive system is beyond dispute.

ELECTRICAL STORMS

Both the DOE Explosive Safety Manual and OSHA require the suspension of blast operations during the approach of the electrical storm. This risk is greater in this activity in that lightening protection devices have been removed and explosives may well be placed in intimate contact with locations where lightning may find a conductive path, such as a steel columns and rebars. All explosive systems, electric or non-electric, are susceptible to electrical storms since a lightning strike can deliver 200,000 Amperes. Considerable induced voltage can also travel along the ground where detonation wire, tubing, or cord has been laid out and potentially provide enough energy to cause an unintentional detonation.

It is required that all personnel be evacuated to the perimeter established for non-essential personnel (the greater of 1250 or $328W^{1/3}$ feet) until the storm has passed. Most DOE sites have Emergency Operations Centers (EOC) that maintain a constant weather watch. Very often, they have real-time access to lightning detection systems and can be ably employed to warn the work site of any approaching storm. A dedicated phone line should be established. All explosive work should cease and evacuation started in time to be completed when the storm is no closer than 5 miles.

WARNING SIGNALS AND POSITIVE CONTROL OF PERSONNEL

A well-planned system for assigning personnel to safe locations and accounting for them during the blast is essential. The blast site perimeter must be secured. The security force should be employed in this effort. As past history in industry has revealed problems with warning signals, there should be a test of the warning signal both well before and immediately prior to the detonation. One innovative demolition contractor solves this potential problem, by using the local fire department which is usually stationed around the safety perimeter.

Enough education should be accomplished at the blast site so that it is universally understood what the signal means. Considerable aggravation can be avoided during the blast if a dress rehearsal of the evacuation plan is conducted. One will be amazed at the number of lost or unaccounted for people during the first dress rehearsal.

SIMULTANEOUS CHARGE PLACEMENT AND MECHANICAL DEMOLITION WORK

It is obviously the best practice not to place explosive charges at the same time when such energetic activities as cutting steel with a torch or using welding equipment are in progress. Good planing should avoid this contingency. However, if such a procedure becomes an operational necessity, a hot work permit shall be obtained and administrated as defined in Chapter II, Section 3.3 of the DOE Explosive Safety Manual. Special care should be taken to control the dripping of any slag and a capable means of extinguishing any potential fire should be located near the heat source. No charges should be primed and no detonation cord (other than pig tails on the actual charge) shall be laid out until all energetic work is complete.

ENJOY THE ACTIVITY

Explosive demolition of buildings is one of the most dramatic, adventurous, and existential areas of the engineering and safety profession. Furthermore, you will likely be associated with a wide range of high qualified professionals. Remember, as long as you take care of the safety aspects early on, it will be very possible to enjoy this activity and transform it into one of the highlights of your career.